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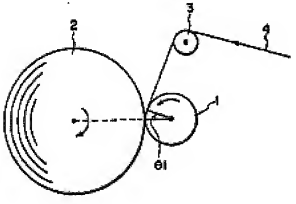
(54) [Title of the Invention]
Film winding method

(57) [Abstract]
[Problem]

To provide a method for winding at high speed without such defects as surface layer wrinkles occurring even when the thickness of the film is thin at 10 μm or less.

[Means of Solution]

When the film (4) is wound on a take-up core (2), the lap angle (θ1) of the film (4) is set to 5 to 30° relative to the contact pressure roller (1) that is pressed into contact with the take-up core (2).



[Scope of Patent Claims]
[Claim 1]

A film winding method, wherein when the film is wound on a take-up core, the lap angle of the film is set to 5 to 30° relative to the contact pressure roller that is pressed into contact with the take-up core.

[Detailed Description of the Invention]
[0001]
[Technical Field to Which the Invention Pertains]

The present invention concerns a method for winding film, and more specifically a method for winding film that uses a contact pressure roller.

[0002]

[Prior Art]

Conventionally, plastic film such as biaxial stretched polyester film (PET film) is wound while pressing in contact with a contact pressure roller to the take-up core surface and then shipped. The contact pressure roller is used to prevent accompanying air from penetrating into the PET film layer that is wound on the take-up core, and, moreover, to prevent wrinkles from occurring in the PET film due to the deaeration of the air that has penetrated. Then, the contact pressure roller is generally constituted by applying a rubber lining to the surface layer of a core material that employs a material such as aluminum, carbon fiber, etc.

[0003]

The angle viewed from the center of the contact pressure roller, the portion where the film comes into contact with the contact pressure roller, is called the lap angle relative to the contact pressure roller, and this lap angle is ordinarily about 180°. However, in recent years, manufacturers of PET have been aiming at increasing the speed of the film-manufacturing lines for the purpose of raising productivity.

[0004]

[Problems the Invention Attempts to Solve]

However, it is extremely difficult to take up at high speed thin PET film whose thickness is for example 10 μm or less. A description is provided below of the problems based on the attached figures. Figure 2 is a schematic view for describing an example of the film pass line for the conventional winding method, and Figure 3 is a schematic view for explaining the appearance when air is wound into the contact pressure roller part and wrinkles occur in the contact pressure roller in the conventional winding method.

[0005]

As shown in Figure 2, the film (4) is wound on the take-up core (2) while being pressed into contact by the contact pressure roller (1). In the conventional case, the lap angle (θ2) of the film (4) relative to the contact pressure roller (1) is ordinarily adjusted to about 180° with a guide roller (3). As the winding speed is raised, air build up (5) occurs between the contact pressure roller (1) and the film (4) as shown in Figure 3, and this phenomenon of air build up becomes the cause of the occurrence of surface layer wrinkles (6) on the take-up core (2). Owing to this, unless productivity is sacrificed by lowering the speed to a low speed of 180 m/min, it is not possible to avoid quality defects such as wrinkles. The purpose of the present invention is to

provide a method for winding at high speed without such defects as surface layer wrinkles occurring even when the thickness of the film is thin at 10 μm or less.

[0006]

[Means for Solving the Problems]

In order to attain the above-mentioned purpose, the present inventors made detailed observations of the effects of the lap angle on the take-up core and the contact pressure roller during the taking up of PET film to the contact pressure roller, and undertook a variety of research, the results of which were that they discovered a method with superior effects and arrived at the present invention. In other words, the gist of the present invention lies in a film winding method, wherein when the film is wound on a take-up core, the lap angle of the film is set to 5 to 30° relative to the contact pressure roller that is pressed into contact with the take-up core.

[0007]

[Mode of Embodiment of the Invention]

A detailed description of the present invention is provided below with reference to figures. Figure 1 is a schematic view for describing an example of the film pass line for the invented winding method. For example, PET film is ordinarily manufactured from the raw material resin in a sheet shape from a melt extruder, then solidifying by cooling this and making it into an amorphous sheet, and vertically stretching it with a roll stretcher, after which it is horizontally stretched with a tenter, and the PET film is then wound on a whole cloth roller. Next, it is shipped by winding it onto the take-up core (2), while it is slit to an appropriate width from the whole cloth roller.

[0008]

As shown in Figure 1, the film (4) is wound on a rake-up core (2) while it is pressed into contact by the contact pressure roller (1). At this time, the inventive method adjusts position of the guide roller (3), and sets the lap angle (θ1) of the film (4) relative to the contact pressure roller (3) so that it becomes 5 to 30° and preferably 10 to 20°. When the lap angle (θ1) exceeds 30°, the effect of the elimination of the inclusion of air (5) **[sic]** declines, so it is not possible to prevent the occurrence of surface layer wrinkles (6) on the take-up core (2) in the event that the winding speed is fully increased. In addition, in the event that the lap angle (θ1) is less than 5°, the end of the product roller that is wound on the core (2) becomes uneven.

[0009]

In the invented film winding method, there are no particular restrictions on the thickness of the target film, but ordinarily the effects are marked in the case of film thin with a thickness of 10 μm or less. In addition, the material of the film may be something other than PET. Moreover, there are no particular restrictions on the contact pressure of the contact pressure roller (1), but it is normally a range of 10 to 100 kilograms per 1 meter of film width, although 35 to 80 kilograms is preferable.

[0010]

[Embodiment]

Next, a more detailed description is provided of the present invention by means of an embodiment, but the present invention is not limited to this embodiment, provided that this does not go beyond the essence thereof.

[0011] Embodiment 1

PET film (thickness 4.5 μm) that was wound on a whole cloth roller was wound on a take-up core (2) while being cut to a width of 1 meter with a slitter. At this time, a roller with a diameter of 13 cm and a straight length of 120 cm, wherein an aluminum core metal is covered with rubber with a hardness of 65°, was used as the contact pressure roller (1) and the contact pressure was set at 50 kilograms. A guide roller (3) was disposed such that the lap angle ($\theta 1$) of the film relative to the contact pressure roller (1) became 20°, and observations of the winding state were made while the winding speed was gradually changed from a low speed to a high speed. Table 1 shows the results, with cases where surface layer wrinkles did not occur indicated as "OK" and cases where surface layer wrinkles occurred indicated as "No Good (hereinafter, "NG").

[0012]

Comparative Examples 1-2

Winding tests of the film were carried out in the same manner as Embodiment 1 other than the fact that the lap angle ($\theta 2$) was set to the conditions of the conventional method (180°) and the lap angle (90°), and observations were made about whether or not surface layer wrinkles occurred in these respective tests. Table 1 shows the results thereof.

[0013]

[Table 1]

Winding speed (m/min)	Embodiment 1 Lap angle 20°	Comparative Example 1 Lap angle 90°	Comparative Example 2 Lap angle 180°
180	OK	OK	OK
200	OK	OK	NG
220	OK	OK	NG
240	OK	NG	NG
270	OK	NG	NG
300	OK	NG	NG

[0014]

As shown in the above results, in the event that the lap angle (θ1 or θ2) of the film relative to the contact pressure roller is 180°, surface layer wrinkles occurred at 200 m/min, and surface layer wrinkles occurred at 240 m/min, even when it is 90°, but in the event that it is 20° within the scope prescribed in the present invention no surface layer wrinkles occurred at 300 m/min.

[0015]

[Effects of the Invention]

According to the inventive method as described above, when thin film with a thickness of 10 μm or less is wound with a contact pressure roller, it is possible in particular to wind at a high speed of 300 m/min, by controlling the lap angle of the film relative to the contact pressure roller to 5 to 30°, and therefore the industrial value of the present invention is great.

[0016]

[Brief Description of the Figures]

[Figure 1]

Figure 1 is a schematic view for describing an example of the film pass line for the invented winding method.

[Figure 2]

Figure 2 is a schematic view for describing an example of the film pass line for the conventional winding method.

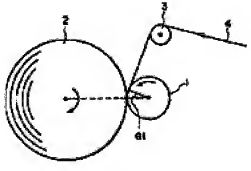
[Figure 3]

Figure 3 is a schematic view for explaining the appearance when air is wound into the contact pressure roller part and wrinkles occur in the contact pressure roller in the conventional winding method.

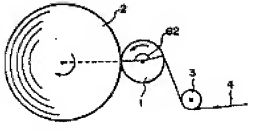
[Key]

1... Contact pressure roller
2... Take-up core
3... Guide roller
4... Film
5... Air build up
6... Surface layer wrinkle
$\theta 1$... Lap angle
$\theta 2$... Lap angle

[Figure 1]



[Figure 2]



[Figure 3]